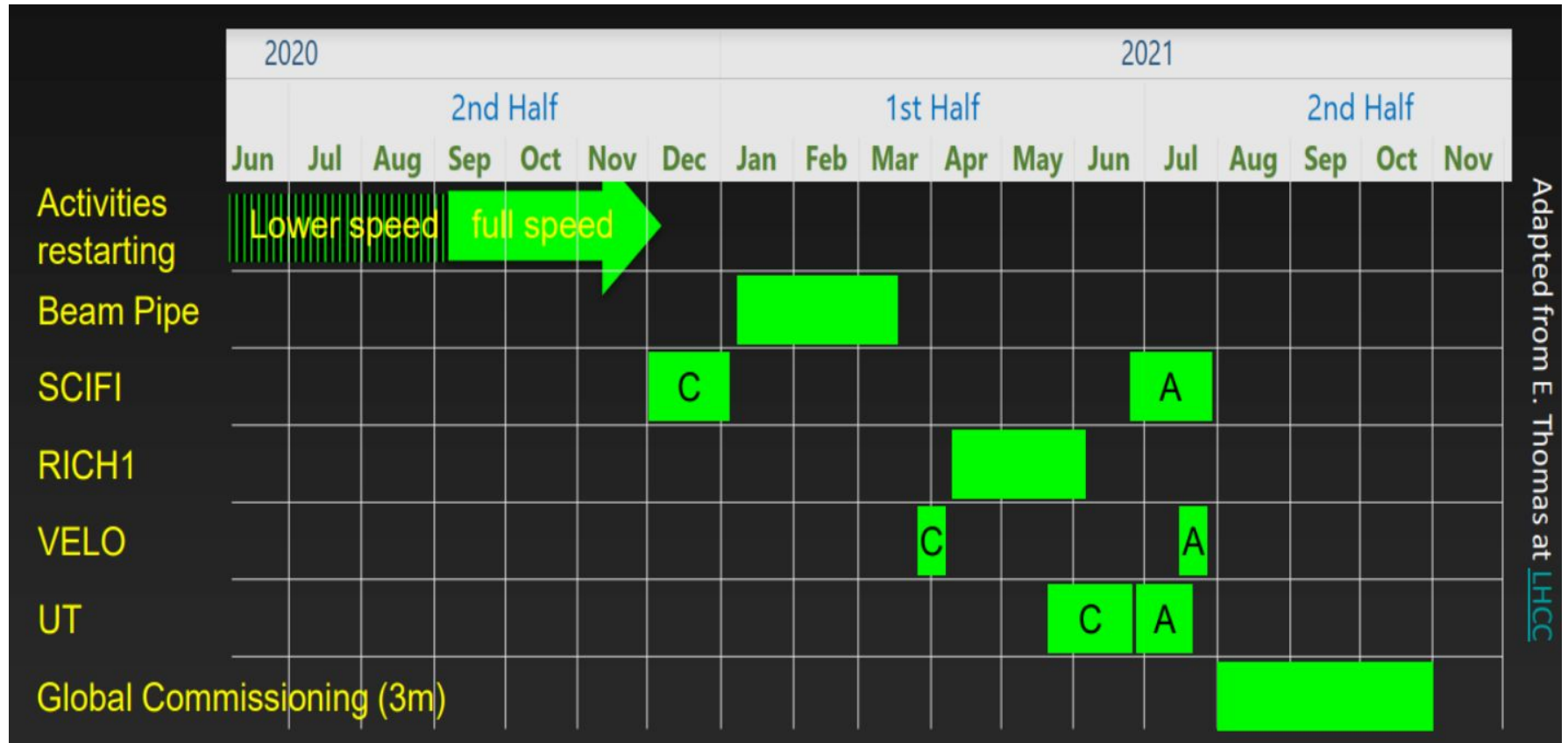


LHCb Upgrade Schedule (2020 - 2021)



Triggerless Data Acquisition

LHCb TDAQ in Run 3

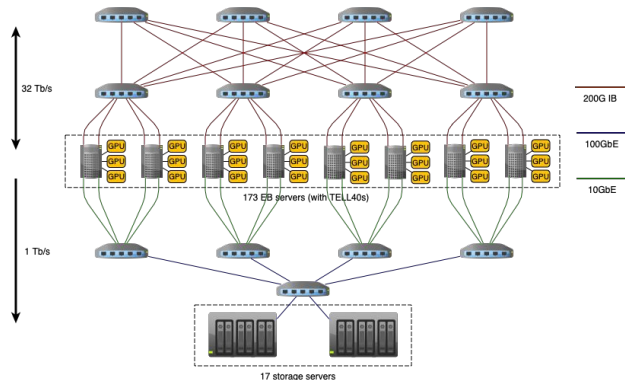
40 Tb/s full detector readout @ 30 MHz ($2 \cdot 10^{32} \text{ cm}^{-2}\text{s}^{-1}$)

Level-1 trigger on GPUs will reduce data rate to 1 Tb/s

Level-2 trigger on CPU will reduce data rate to 80 Gb/s

Level-1 ~traditional selective trigger, output saturated by signal.

Level-2 real-time analysis reconstructs signals with offline analysis quality in real-time.



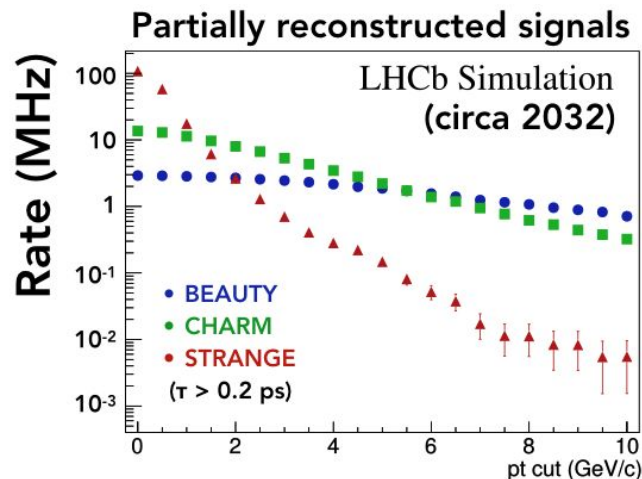
LHCb TDAQ in HL-LHC

Run at up to $1.5 \cdot 10^{34} \text{ cm}^{-2}\text{s}^{-1}$, almost O(Pb/s) data rate

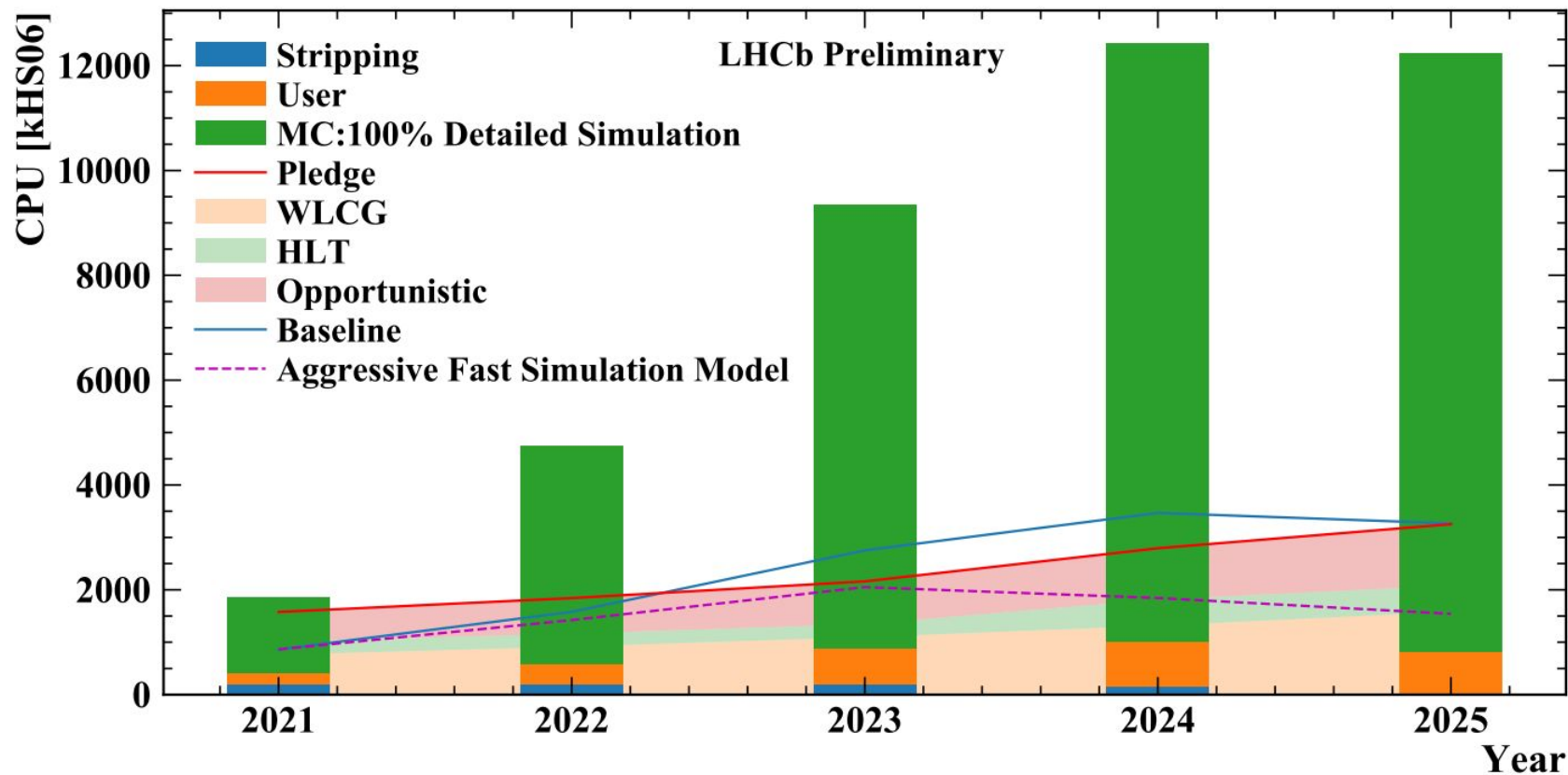
Processing complexity dominated by Level-2.

As single event complexity and Level-1 rate increase linearly with luminosity, overall processing cost rises quadratically.

Exploit new reconstruction algorithms (e.g. AI) or detector information (e.g. timing) to suppress pileup already at Level-1

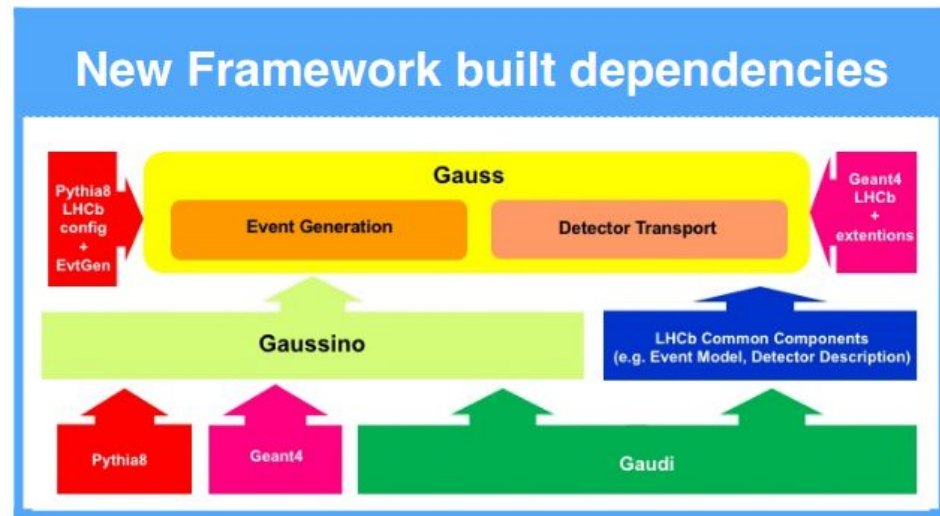
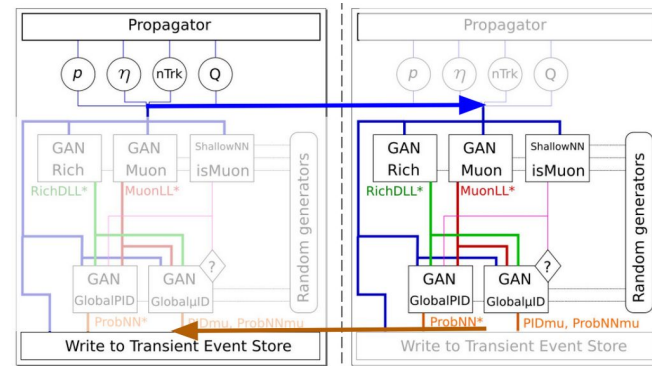
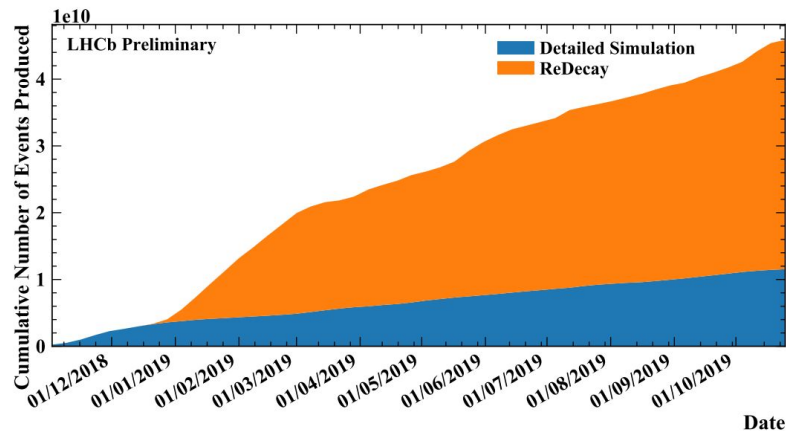


Simulation Bottleneck



Fast(er) Simulation

- ECAL/HCAL using a point library and GAN
- PID and RICH using GANs via Lamarr
- Gaussino -> multi-threaded LHCb independent simulation framework
- generation with redecay (implemented) and forced hadronization (future)



Data Processing and Analysis

- given short timescale, detail missing here ...
 - DPA now official project within LHCb
-
- sprucing - centralized offline data selection
 - analysis productions - working group productions for analyses
 - offline analysis tools - also includes analysis packages outside LHCb
 - innovative analysis - prototype new techniques for mainstream adoption
 - legacy software and data - support for run 1 and 2